AMENDMENTS TO THE SPECIFICATION:

Please amend the paragraphs beginning at page 3, line 1, and continuing to page 4, line 9, as follows:

An object of the ~~present invention~~ technology disclosed herein is thus to provide methods and devices for resource management providing a high utilisation of resources while providing a fair allocation between different operators. A further object is to integrate the usage of priority levels in such managing methods and devices. Yet a further object is to provide renegotiations of resources within the same management scheme. Another object is to reduce the influence by calls requesting large resources at near-congestion occasions.

~~The above objects are achieved by methods and devices according to the enclosed patent claims.~~ In general words, a decision to accept or reject a received access request is taken based on at least three comparisons. The first comparison is between the total amount of free resources available in the communication system that can be used for the access and the requested amount of resources. The second comparison is made between a total amount of occupied resources if the access request would be accepted and a first threshold. The threshold corresponds to some kind of congestion level threshold. The third comparison is if a total amount of resources used by the operator in question if the access request would be accepted would exceed a second threshold. This second threshold is a portion of the total resources that is allocated to the operator in question. The access request is preferably accepted if the first comparison shows that there are resources available and if the second comparison tells that no congestion is present. The access request can also preferably be accepted if the second comparison tells that a congestion is present, but the operator has not yet utilised his allocated portion of the total resources.

In one example embodiment ~~of the present invention~~, a so-called soft congestion check is performed, in which access requests requiring large amount of resources gradually are discriminated when the system approaches congestion. In a further example

embodiment~~of the present invention~~, priorities of access requests that are not immediately accepted are checked, and if there are possibilities for pre-empting ongoing calls with lower priority to achieve enough free resources, such pre-empting is performed based on the degree of utilisation of the resources compared with the allocated portion. In yet another embodiment, renegotiations of ongoing calls for increasing the required amount of resources are handled as additional access requests for the difference between requested and presently used resources.

~~The~~ An advantage of the technology disclosed herein~~with the present invention~~ is that relatively simple procedures can achieve a fair and efficient management of limited resources. Furthermore, the procedures can be implemented in devices, which are easily integrated in or with presently existing hardware.

Please amend the paragraphs beginning at page 4, line 21, and continuing to page 4, line 24, as follows:

FIG. 3 is a flow diagram illustrating the main steps of a method according to an example embodiment~~of the present invention~~;

FIG. 4 is a part of a flow diagram illustrating a further example embodiment~~of the present invention~~ supporting priority levels;

Please amend the paragraph beginning at page 4, line 28, and continuing to page 5, line 7, as follows:

FIG. 7 is a part of a flow diagram illustrating another embodiment of the technology disclosed herein~~present invention~~ supporting renegotiations of resources;

FIG. 8 is a diagram illustrating threshold levels in a soft congestion system according to an example embodiment~~the present invention~~;

FIG. 9 is a flow diagram illustrating the main steps of a method according to an example embodiment ~~of the present invention~~ utilising soft congestion discrimination;

FIG. 10 is a flow diagram illustrating a part of the example embodiment of Fig. 9; and

FIG. 11 is a block diagram illustrating an example embodiment of an implementation of a device~~ according to the present invention~~.

Please amend the paragraph beginning at page 6, line 22, and continuing to page 6, line 30, as follows:

~~The~~ A basic idea of the technology disclosed herein~~present invention~~ is an approach, which can effect control over the resource utilisation between the two extreme cases. To maximise the overall efficiency, all connections are accepted during non-congested situations. If an excess of resources is available, it should be used, regardless for which operator. This means that an operator can exceed the agreed proportion when the resources are abundant. However, at or close to congestion, defined in some way, other rules have to be applied. According to the technology disclosed herein~~present invention~~, new connections are only accepted during congested periods if the operator's agreed proportion is not exceeded.

Please amend the paragraphs beginning at page 7, line 8, and continuing to page 8, line 6, as follows:

In order to exemplify the behaviour of a system according to the technology disclosed herein~~present invention~~, Fig. 2 schematically illustrates the shared resources of a fictive system as a rectangle. The area of the rectangle corresponds to the totally available resources C. In this example, three operators share the resources. In an agreement between the operators, operator 1 is allocated a portion p_1 of the total resources, i.e. an amount of resources $C \cdot p_1$ is intended for operator 1. Likewise, operator 2 is allocated a portion p_2 of the total resources, i.e. $C \cdot p_2$. Finally, operator 3 has agreed to only utilise an amount of resources corresponding to $C \cdot p_3$.

A congestion threshold β is configured. Above this threshold, the system is in a congested state, and special actions have to be taken in order to utilise the remaining resources in a fair manner. In order to further exemplify the technology disclosed

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herein~~invention~~, a particular traffic situation is considered. The shared resources are used by the three operators in different amounts, u_1, u_2 and u_3, respectively. The rectangle of Fig. 2 is hatched in a corresponding manner. An amount of free resources Δ is still available. One may here realise that operator 1 at this very moment exceeds his agreed portion of the resources, since u_1 is larger than $C \cdot p_1$. Operator 2 uses a smaller amount of resources than the agreed proportion and operator 3 has a resource utilisation that is about equal to the agreed portion.

Let us consider four different cases. In the first case, a new access request Ra arrives for a customer using services delivered by operator 1. The access request requires an amount of resources corresponding to r_a. r_a is smaller than Δ, so there are enough resources available in the total system for handling the new request. However, the access request will utilise such a large portion of the resources that the total utilisation exceeds the congestion threshold β. Since the access request comes from operator 1, which already uses more than his allocated portion of resources, the remaining resources Δ should instead be "reserved" to operator 2. The access request Ra is therefore ~~according to the present invention~~ denied.

Please amend the paragraphs beginning at page 8, line 18, and continuing to page 8, line 24, as follows:

In a third case, a new access request Rc arrives for a user connected to operator 2. The access request requires an amount of resources corresponding to r_c, which is larger than r_b. Here, r_c is also larger than the amount of free resources Δ, which means that there are no possibilities to accept the access request unless any further prioritising and pre-empting of other calls are performed. In a basic version ~~of the present invention,~~ the access request is denied.

Please amend the paragraph beginning at page 9, line 1, and continuing to page 9, line 11, as follows:

Fig. 3 illustrates a flow diagram of the main steps in an example embodiment of a method according to the technology disclosed herein~~present invention~~. The procedure starts in step 200. In step 202, an access request from a certain operator is received. The access request has an associated required amount of resources. Alternatives of this step are discussed further below. In step 204, it is determined if the associated required amount of resources of the access request is smaller than the total amount of free resources in the system. If the required amount of resources is too large, the procedure continues to rejection procedures (step 212) described more in detail below. If there instead are enough free resources, the procedure continues to step 206.

Please amend the paragraph beginning at page 14, line 1, and continuing to page 14, line 11, as follows:

The above procedures operate well for situations in which the resource allocation is linear or near linear. However, when the non-linearity of resource allocation in a system increases, the basic procedures described above have to be slightly modified. In such a case, an updating mechanism according to a preferred example embodiment ~~of the present invention~~ can be applied. The linear shared resource allocation model described above can thus be used to model allocation schemes which are non-linear in some cases. The performance of the system can be improved if there are some communications between the above described module and another module which can maintain a more accurate measure of the non-linear resource utilisation.

Please amend the paragraph beginning at page 15, line 4 and continuing to page 15, line 14, as follows:

A resource managing method and device according to the technology disclosed herein~~present invention~~ can easily be modified to also incorporate priority handling. One embodiment will be described here below, which permits high-priority connection requests to access the resource at the expense of lower priority connections, if necessary. Since this can involve pre-emption of calls, it is useful to integrate this with the functions

that are aware of the shared nature of the resources in order to try to ensure that the resource is shared according to the policy agreed by the operators. The most important decision that needs to be made in this case is to determine which call or calls need to be terminated prematurely. Specifically, it can be desirable to differentiate between connections based on which operator they are associated with.

Please amend the paragraph beginning at page 20, line 6, and continuing to page 20, line 20, as follows:

In the example embodiment ~~of the present invention~~ described in connection with Fig. 3, the congestion threshold can be described as a hard threshold. This is because up to the point of congestion a connection of any size will be accepted for any operator. This, however, means that an operator may occupy a large chunk of the available resources when nearing hard congestion, which may counteract the intention to follow the agreed division of resources at congestion. In another example embodiment ~~of the present invention~~, a concept of soft congestion threshold is introduced. Soft congestion is a threshold that is lower than the hard congestion value. When the soft congestion threshold is exceeded, not all access requests are rejected, just the largest ones. In other words, only connections up to a certain size are accepted. A number of soft congestion thresholds may be set. For each threshold, the size of the largest permitted connection is also configured. These parameters are preferably static and can be defined by a management system.

Please amend the paragraph beginning at page 20, line 22, and continuing to page 20, line 31, as follows:

Fig. 8 illustrated the basic principles of soft congestion thresholds. In the rectangle representing the total amount of resources, the hard congestion threshold β is still present, relatively close to the maximum. However, three additional soft~~sift~~ congestion thresholds α_1, α_2 and α_3 are also illustrated. For each of these thresholds, a maximum accepted size

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ξ_1, ξ_2 and ξ_3, respectively, is set. If the total utilisation degree passes the threshold α_3, only access requests of sizes less than ξ_3 are accepted. Similarly, if the total utilisation degree passes the threshold α_2, only access requests of sizes less than ξ_2 are accepted, and if the total utilisation degree passes the threshold α_1, only access requests of sizes less than ξ_1 are accepted.

Please amend the paragraph beginning at page 23, line 30, and continuing to page 24, line 2, as follows:

There are two prerequisites that need to be met before applying the procedures of the technology disclosed herein~~present invention~~. The total credit information is reported by the Node B per uplink and downlink separately. The Node B reports the total credit information for a group of cells, as the procedures are designed to share resources in the cell group.

Please amend the paragraph beginning at page 24, line 30, and continuing to page 24, line 31, as follows:

[1] Shared Networks for WCDMA, Solution Description, April 2003~~,~~ ~~URL:http://productselector.ericsson.se~~.